

## REMARKS

Claims 1-14 and 19-21 stand rejected. Claims 1, 2, 10, 12, 14, and 19 have been amended and claims 15-18 have been canceled without prejudice to consideration in a continuing application. Reconsideration of the present application as amended is respectfully requested.

The Office Action objected to dependent claim 12 as being unclear. This claim has been amended in a manner believed to address such concerns. In making this rejection, the Office Action inquired as to the nature of a “one dimensional energy equation.” On page 27, lines 15-16, of the present application, one nonlimiting embodiment of the one-dimensional energy equation is provided as equation number 23.

The Office Action rejected claims 1-14 and 19-21 under 35 U.S.C. § 101 as reciting only an abstract mathematical algorithm and thereby not producing a concrete, tangible, and useful result. While the Applicants believe the claims as presented comply with the requirements of §101, minor changes have been made to certain claims to clarify compliance.

“Only when the claim is devoid of any limitation to a practical application in the technological arts should it be rejected under 35 U.S.C. 101.” Manual of Patent Examination and Procedure (MPEP) § 2106(II)(A) (citations omitted). Indeed, this practical application feature is often recognized as a basis of §101 compliance for computer-related processes. See, MPEP §2106IV.B.2.(b). Further, safe harbors are recognized on other grounds, such as when a process requires independent physical acts to be performed outside the computer and/or when the process requires the measurement of physical objects or activities to be transformed outside of the computer into computer data, where the data comprises signals

corresponding to physical objects or activities external to the computer system, and where the process causes a physical transformation of the signals which are intangible representations of the physical objects or activities.

With these recognized grounds in mind, claim 1 includes the features of performing the simulation sequence with the computer in accordance with the parameter value and process conditions to simulate thermal flow for a casting or molding process. This computer-involved method is directed to the practical application of simulating thermal flow for casting or molding. Such simulations are typically used to predict and adjust casting and molding processes. Accordingly, it is believed that claim 1 comports with §101.

As to independent claim 2, it is directed to the practical application of simulation of a thermal fluid flow in a die for casting or molding. Independent claim 10 includes performing a simulation of a thermal fluid flow in a die with a computer, and independent claim 19 includes performing a simulation of a thermal fluid flow for a casting or molding process with a computer. Accordingly, it is believed these claims also comply with §101. All pending dependent claims are likewise believed to be compliant for at least the same reasons as the corresponding independent claims.

The Office Action rejected claim 1 as unpatentable in light of a combination of U.S. Patent No. 5,377,119 to Backer et al. (hereinafter the “Backer reference”), U.S. Patent No. 5,677,844 to Kubo (hereinafter the “Kubo reference”), and U.S. Patent No. 6,530,418 to Ebisu et al. (hereinafter the “Ebisu reference”). The Applicants respectfully traverse. “To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally

available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure." Manual of Patent Examining Procedure (MPEP) §2142 (*citing In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)). Moreover, the suggestion/motivation to combine or modify under §103 needs to be specific. Where a "statement is of a type that gives only general guidance and is not specific as to the particular form of the claimed invention and how to achieve it ... [s]uch a suggestion may make an approach 'obvious to try' but it does not make the invention obvious." *Ex parte Obukowicz*, 27 USPQ2d 1063, 1065 (U.S. Pat. and Trademark Off. Bd. of Pat. App. & Interferences 1993) (*citations omitted*).

Claim 1, as amended, includes the features of "deciding whether to execute post-process simulation modules, said post-process simulation modules including a Mend Line Prediction Module." None of the references cited by the Office Action teach such features. The Backer reference teaches on column 4, lines 45-62, that ten-listed steps simulates the mold filling process. These steps therefore constitute the process to be simulated. The Office Action relies on column 7, lines 57-60 of Backer to teach this feature, including a Mend Line Prediction Module. However, column 7, lines 57-63 merely state:

By summing the change in the volume of the melt contained in each element, a new interface position between the melt and air in the mold cavity can be identified. This position can then be utilized as the location where new pressure boundary conditions on the melt are implemented in a new time step.

As a review of this passage reveals, it fails to teach or suggest a post-process simulation, let alone any kind of Mend Line module, giving such terms there broadest reasonable meaning. The other references do nothing to cure such deficiencies.

In addition, claim 1 includes the features of “checking if parameters have converged, returning to step (d) if they have not.” The Office Action relies on Figure 1, elements 8 and 9 of the Backer reference to teach such features. Elements 8 and 9 of the Backer reference either return the process to (1) compute the pressure in a permeable sand mold or (2) begin the process anew, which does not teach “returning to step (d) if they have not,” where step(d) includes forming and solving momentum equations, and updating velocity and pressure fields. The remaining references of the combination are likewise lacking.

Along these same lines, claim 1 includes the features of “determining whether an end-simulation event has occurred, returning to step (c) if it has not.” Again, the Office Action relies on Figure 1, elements 8 and 9 of the Backer reference to teach this features. Step (c) is “updating material balance,” which is clearly not the result of elements 8 or 9 in Backer, and also is missing from the other references of the asserted combination. Accordingly, numerous reasons support the patentability of claim 1.

The Office Action rejected claims 2-8 as unpatentable in light of a combination of the Backer reference, the Kubo reference, and U.S. Patent No. 5,940,309 to White et al. (hereinafter the “White reference). The Applicants respectfully traverse. Claim 2 includes “a shot sleeve and ram for the die as a function of ram position.” The Office Action contends that column 3, lines 9-16, of the Backer reference teaches such features. To the contrary, even assuming, arguendo, that the “runner” of the Backer reference somehow teaches a shot

sleeve, nowhere does it teach a “ram for the die,” much less as a “function of ram position” as recited in claim 2. Moreover, neither the Kubo reference nor the White reference corrects the failure of the Backer reference.

Claim 2 also includes “shrinkage of casting as a function of porosity.” The Office Action maintains that column 3, lines 21-23 of Backer teach such features. In fact, this passage merely states: “calculating a total volume of any regions of gas which have been separated from the permeable mold and sealed into the melt,” which lacks any reference to a model of shrinkage of casting as required by claim 2. Furthermore, neither the Kubo reference nor the White reference teach these features.

Claim 2 also includes the “a heat transfer line embedded in the die, die lubricant cooling, and mend line formation.” The Office Action does not even appear to provide a supporting citation with respect to these features. Therefore, claim 2 is patentable over the references cited by the Office Action.

Claims 3-8 all depend from independent claim 2 and therefore are allowable for at least the same reasons as independent claim 2. Furthermore, additional reasons support patentability of rejected dependencies. In one example, claim 6 includes the features of “determining the temperature field according to non-coincident heat transfer between the shot sleeve, the ram, and the thermal fluid flow.” None of the references teach these features.

The Office Action rejected claim 9 as unpatentable in light of a combination of the Backer reference, the Kubo reference, the White reference, and U.S. Patent No. 5,050,114 to Lee (hereinafter the “Lee reference”). The Applicants respectfully traverse. Claim 9 depends from independent claim 2 and therefore includes all of its limitations, and is likewise

patentable. Furthermore, the Lee reference is directed to thermal cooling in connection with the operation of an integrated circuit chip (see column 1 of Lee) -- not a manufacturing process that includes casting or molding. Accordingly, this reference is nonanalogous. Moreover, combining such differently directed teachings would at the very least bring into doubt any reasonable expectation of success. In addition, the office action contends its citations to passages in columns 3 and 4 reference spray lubricant application to a die. To the contrary, these passages lack any discussion of a spray lubricant or die. Thus, numerous reasons support allowability of claim 9.

The Office Action rejected claims 10-14 as unpatentable in light of a combination of the Kubo reference and U.S. Patent No. 5,661,670 to Bharathan et al. (hereinafter the "Bharathan reference."). The Applicants respectfully traverse. Claim 10 includes the features of "providing a model of a heat transfer line in a die for casting or molding." The Office Action maintains that column 4, lines 20-28, and FIG. 4 of the Kubo reference teaches these features. The Kubo reference teaches in the cited passage that a certain element ( i,j ) is surrounded on four sides by four different elements, and lacks anything remotely similar to such terminology -- giving it the broadest reasonable meaning. Indeed, in one nonlimiting embodiment, the specification of the present invention teaches in FIG. 7 and the corresponding description, that heat transfer from the mold travels along a specified heat transfer line preformed to carry heat out of the mold. Claims 11-14 all depend from independent claim 10 and therefore are patentable for at least the same reasons.

The Office Action rejected claims 19-21 as unpatentable in light of a combination of the Kubo reference and the Lee reference. The Applicants respectfully traverse. The diverse

nature of these two references again point to the unlikely expectation of success, and would discourage those skilled in the art from considering the combination. Consequently, there is no motive or suggestion to establish a prima facie case under §103. Moreover, as previously indicated, the Lee reference lacks any reference to spray lubricant or a die -- let alone application of spray lubricant to a die as asserted in the Office Action. Claims 20 and 21 are patentable for at least these same reasons due to dependence from claim 19.

In view of the foregoing, it is believed that claim 1-14 and 19-21 are in condition for allowance. Reconsideration of the present application as amended is respectfully requested. The Examiner is encouraged to contact the undersigned by telephone to resolve any outstanding matters concerning the present application.

Respectfully submitted:

A handwritten signature in black ink, appearing to read 'L. Scott Paynter', with a large, sweeping horizontal stroke extending to the right.

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